Writing in the Sciences

The challenge, and goal, of scientific writing is to convey information as clearly and explicitly as possible. Because of this, people sometimes say that science writing is very different from writing in the humanities—those subjects that “indulge in the beauties of language”—but this is not the case. Just as one must convey his or her point effectively in an essay for an English class, so must a written report be a work of art in its own right. Science writing has more rigid guidelines and structure, but relies on the same core principle that embodies up all great writing: the ability to connect with the reader. Those that dismiss the idea of beautiful writing in favor of strictly functional writing often end up with a product this is difficult and frustrating to read. And often this is among the most important factors that determine whether a scientific report is noticed or dismissed. So if you are a writing fellow and are feeling insecure about your ability to help, take heart! You already have the most important tools you need to be an effective tutor. Above all else emphasize that the report should be readable…or people won’t read it! The guide below will help you with the specifics.

DISCLAIMER: While these sections are usually found in formal lab reports, their inclusion and extent depends on the class in question. See below for more class-specific information.

Title page

Not always required; contains the title of the report as well as the authors’ names, the date, the school, the professor, and anything else the student feels like slapping on. There are varying opinions as regards the title of the report: some professors expect the results to be stated in the title (although this is generally rare), while others are much happier with a more enigmatic choice. Overall; however, the title should be informative. Students should be advised to stay away from something cute. Oh, and a colon is usually a good idea.

Abstract

A short paragraph which summarizes the paper. It is usually single-spaced and about 150 words long, although it can vary from 10 words to around 300. The abstract should be able to be understood (at least for the most part) without having to look at the rest of the report. In my opinion, the easiest way to write the abstract is to write the paper and then take a sentence or two out of each of the sections (introduction, materials and methods, etc), and then modify them so they flow together well. Note that the abstract does not have to be original, it can contain exact sentences from the write-up. In real life this is, in some ways, the most important part of the report, although it is usually not very important to professors in college classes.

Introduction

Context, context, context. Why is the research question important and how does it relate to previous studies. You can think of the introduction as a funnel. It starts off very broad and then narrows as it goes. Sometimes it is nice to begin with a brief statement summarizing the goal of the study and then to move on to context, but this is completely optional. Primary sources should be engaged thoughtfully: one technique is to compare/contrast the studies while pointing out
their weaknesses. But in any case, the reader should ultimately be lead to the conclusion that this study is a freaking god-send, and thank the lord that the gaping hole in everyone’s knowledge will be filled. As a side-note, discourage “story telling” in this section (i.e. first this happened, then this, then this). Towards the end of the introduction hypothesis and predictions should be stated clearly, along with the rational for the predictions (if this is not obvious from the background information).

Note that this (along with materials and methods) is one of the sections that varies a lot depending on the class in question.

**Materials and Methods**

This section describes the design of the study, as well as the rational for the design. Students often wonder where they should place their analytical methods (i.e. what statistical tests did they run) and the answer is right here baby. Depending on the class, much of this section can often be dispensed with using something along the lines of: “we followed the procedure as stated in the lab handout with no deviations.” Of course, if this was a study in which students designed the procedure themselves, the methods should be very detailed. Often for the more complicated experiments a snazzy flowchart or table is a good idea. For after all, the more quickly the professor (or any reader for that matter) understands what is going on, the happier he/she will be.

**Results**

The results section is where many students go wrong. Here the narrative seems to break down leading to a frustrating mish-mash of irrelevant numbers and choppy sentences. See the first paragraph of this entry! The results should be stated in a concise, easy to understand way that works *with* not against the reader. Figures and tables should be referenced in this section but the reader should not have to look at the figures in order to understand the results. The text should stand alone. This is not to say that every little piece of data should be included in this section: the results should guide the reader’s hand and point to the most important and telling information. Remember: the results should not be analyzed here. Students will always be tempted to do this, but they must resist!

**Discussion**

This section, with few exceptions, is the one that professors care about the most. And for good reason: the discussion explains what it all means, whether the hypothesis was right or wrong, and what should be done about it. The discussion should compliment and be enhanced by the introduction—almost as if the sections in between were simply one giant footnote and now the narrative can continue again. This section should also discuss the weaknesses in the experimental design (but *don’t* list small sample size as a factor—I’m looking at you psych people!) and future experiments that could address those weaknesses or take the results one step further. There is a lot of freedom in writing the discussion, students should make good use of it.

**Literature Cited**
I highly recommend Refworks. Make sure the student asks the professor (if it is unclear) what
citation format he/she prefers.

**Tables and Figures**

Emphasize to the student that all the information they need to format these correctly is in the lab
manual. Tables and figures should be able to stand alone, therefore the caption should adequately
explain the table or figure. Figure captions go below while table captions go above. Check to
make sure axes are labeled.

So that’s about it for the sections of the report. On to class specific information.

**Class Specific Information**

Here I invite you science majors to help fill this section out. This is a wiki after all…

**Bio 40, 41C, 41E**

Since the above information was adapted from handouts from these classes, I don’t have much to
add. However, note that Bio 40 professors are generally much more nit-picky about the title, the
format of the tables and figures, and other (in my opinion) less-important details of the lab
report. Although I still recommend Refworks for the citations, note that the format they want is
some strange mix of the Council of Science Editors format and something else, so some minor
tweaks to the citations will be necessary. Make sure the student looks at the lab manual carefully
to assure that everything is as it should be. In 41E it is usually a good idea to include a
description of the taxonomic group and study site(s) in your materials and methods section.

**O-Chem**

I believe the esteemed Carolyn Bacon is currently making a handout entitled “How to write an
O-Chem lab report,” so I will refer you to that. Briefly the materials and methods/results section
do not need to be as detailed as they would in a Biology lab report. Here my opening monologue
does not really apply. The introductions can be extremely brief (no primary literature necessary)
and the materials and methods section can almost always be dispensed with using the classic,
“we followed the procedure as stated in the lab handout with no deviations.” Students should rely
heavily on the figures in the results section, and tell them not to worry too much about having the
text of this section be super eloquent. **Do** make sure that a table of reactants and products is
included and **do** make sure the discussion is not skimped on. Also, lab professors often require
that sample calculations are included. I have seen students spend way too much time making O-
Chem lab reports Bio 40-esk; tell them to save their sanity!

**Biochem**

Very similar to O-Chem. Brief introduction, brief materials and methods, brief results. Focus on
discussion.
Finally, a note on posters

The major difference between a write-up and a poster is that a poster should not contain a large body of text—in some cases it does not need any! Large blocks of text on a poster are usually not read, and bullet points are often more effective. Bullet points are especially good for wrapping up the conclusions of the study. If the student knows he/she will be standing next to the poster when it is presented he/she should take that into account by leaving space for verbal additions. Every detail of the study need not be featured on the poster itself. The results section can usually be conveyed entirely through tables and figures. Finally, although this may seem obvious, remind students that posters should be eye-catching. Along these lines, they have a little more leeway when it comes to the title. Now is the chance to use that cute title that couldn't go in the paper.

Some of this handout was adapted from handouts from Professor Fran Hanzawa's Bio 41E spring 2010 class, as well as the Bio 41C laboratory manual.